sPHENIX Cost and Schedule Review

Nov 9-10, 2015

BNL

The sPHENIX Project

The PHENIX Experiment has completed its 15th year of operation.

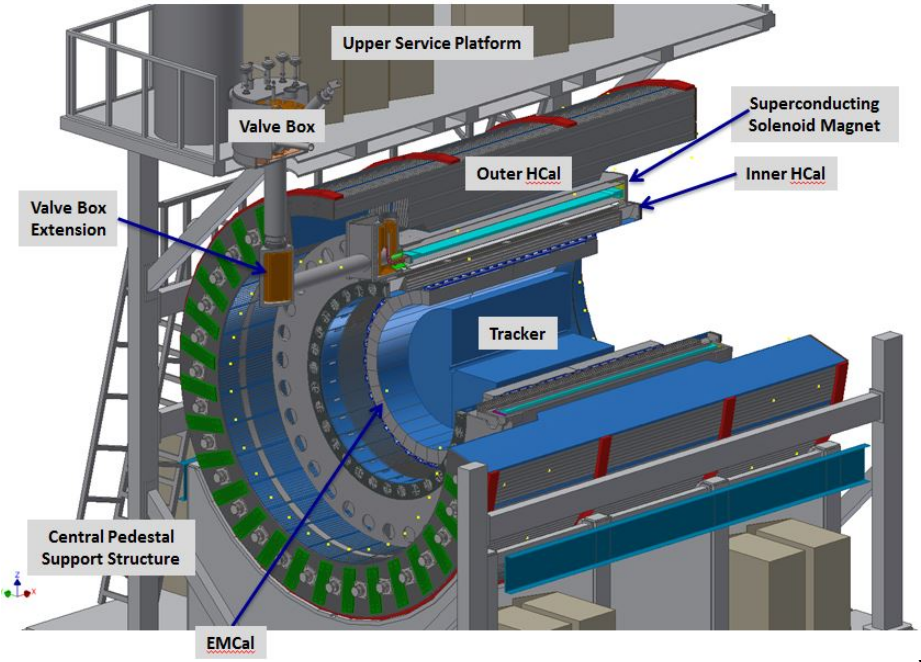
The majority of the equipment was designed and built in the mid-1990's

Particular physics results from both LHC and RHIC call for measurement capabilities that are beyond those available at either PHENIX or STAR

A proposal has been submitted to DOE to build a mid-size detector with the following features:

- High rate, relatively unbiased trigger
- Strong magnetic field: SC magnet
- 2π calorimetry coverage, both EMCal and HCal
- Modern technology but nothing that requires long lead time development
- Reuse of most infrastructure in the **1008 complex** including the DAQ and computing (with modest updating)
- Build to a schedule that would allow the first sPHENIX run in early 2021
- Potential future application as a foundation for an EIC detector

sPHENIX Reference Design



- Uniform acceptance $|\eta| < 1.1$ and $\phi = 2\pi$
- Use of BaBar solenoid now at BNL
- Hadronic calorimeter doubling as flux return
- Compact electromagnetic calorimeter to allowing fine segmentation at a small radius
- Solid state photodetectors that work in a magnetic field, have low cost, do not require high voltage
- Common readout electronics in the calorimeters
- High rate 15+ kHz in AA allows for large unbiased MB data sample
- Potential re-use of PHENIX silicon vertex detector plus additional silicon tracking layers.

We've strived to keep the sPHENIX design as straight-forward and low cost as practical

sPHENIX Status

- The project is pre CD-0. Currently in Pre-conceptual design stage.
- DOE-charged Science Review April 30, 2015
  - Very positive outcome. Laudatory report with no action items.
- Expect CD-1 Q1FY 18
- Planning Goal : sPHENIX available for RHIC FY21 Run starting in early spring 2021.
- Estimated Cost Range $65M - $75M TPC/$55M-65M TEC (Depends on assumptions about labor and success of potential material cost reductions)
- Actively Engaging Collaborators to pursue additional complementary detector upgrades, applying to NSF and other international funding agencies for support.
- New science collaboration is being formed around the experiment. 1st collaboration meeting Dec 10-12 @ Rutgers Univ

Recent sPHENIX Calendar

• sPHENIX Proposal submitted to DOE	Fall 2012
• DOE Science Review	July 2014
• Internal Rev of SC-magnet	Dec 2014
• Internal Rev of Decommissioning and Installation	Jan 2015
• Internal Rev of HCal	Feb 2015
• BaBar magnet arrives at BNL	Feb 2015
• Internal Rev of Calorimeter Electronics	Mar 2015
• DOE Science Review	April 2015
• Org Meeting to form new sPHENIX Scientific collaboration	Jun 2015
• Internal Rev of EMCal	Aug 2015
• NPP Director's Cost and Schedule Rev	Nov 2015
• 1st Meeting of new sPHENIX Collaboration	Dec 2015

Many internal reviews and a successful DOE Science Review

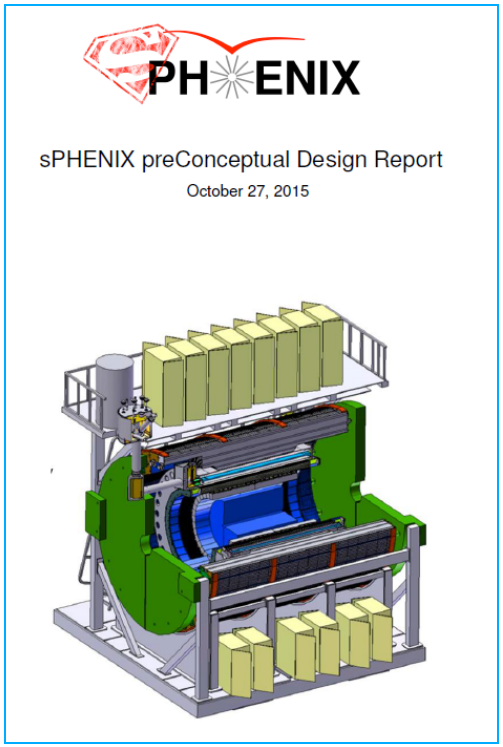
Review Recommendation Tracking System:
http://www.phenix.bnl.gov/~irina/sPHENIX/allcomments.php

Context of the Review

- The project is ~ 18 months from a OPA CD-1 review
- All designs are pre-conceptual
- We have chosen technologies for the reference design and that allows us to do initial schedule, resource, costing and contingency estimations
- We're in the 1st round of prototyping
- There are a number of unresolved questions and in the case of Tracker multiple options to consider.
- The earliest we will begin final fabrication is 4QFY18. 3 years from now.
- We have time before we need to make all final technology choices, but from an efficiency point of view we would like to make the decisions as soon as possible.

Documentation Made Available to the Committee

- Preliminary Conceptual Design Report
- WBS and WBS Dictionary
- sPHENIX Science Proposal to DOE plus DOE Review report
- Basis of Estimate Documents
- Preliminary Risk Analysis and Mitigation Document
- Recommendation Resolution Document
- Preliminary Safety and Hazard Analysis
- Preliminary Quality Assurance Plan



Basis of Estimate Documents

Fab SC-magnet quench protection

	sPHENIX Detector **Relativistic Heavy Ion Collider** **BASIS of ESTIMATE (BoE)**	**Date of Est:** 10/1/2015 **Prepared by:** D. Phillips **DocNo. (refer Rev. Log):**
WBS number: 1.2.3.3.1.3	**WBS Title:** Procure/Fabricate PS-Mag-QD DC Hook-up Parts	
WBS Dictionary Definition: Refer. WBS Dictionary		

Estimate Type (check all that apply):

___ Work Complete
___ Existing Purchase Order
___ Catalog Listing or Industrial Construction Database
___ Documented Vendor Quotation based on Drawings/ Sketches/ Specifications
___ Budgetary Estimate by Vendor/Fabricator based on Sketches, Drawings, or other Written Correspondenc
_x_ Engineering Estimate based on Similar Items or Procedures
___ Engineering Estimate based on Analysis
___ Expert Opinion

Supporting Documents (including but not limited to):
535mcm cable = 12 cables x (50' PS-WCB + 50' WCB-Mag + 50' Mag-DR + 25' DR-WCB + 50' WCB-PS) x $16/ft = $48k
Lugs = 10 locations x 12 lugs/location x $25/lug = $3k
Water Cooled Buss (WCB) Parts = $3k
Cable Tray Parts = $4k
Miscellaneous Parts = $2k
Total = $60k

Details of the Base Estimate (explanation of the Work)

This estimate is for materials for hook-up of the DC power from the Power Supply in 1008B to the Magnet in 1008-IR, including the hook-up to the Dump Resistor (which may be located in 1008B or 1008-IR).

Assumptions Used in Developing Estimate:

- Reusing existing PHENIX Magnet Water Cooled Buss (two pairs of WCB in parallel, with minor modifications) as the connection between 1008B and 1008-IR.
- 12 each 535 MCM cables to carry the 4600 A magnet current.

Cost Summary

	Material [$]	Designer [d]	Engineer [d]	Tech [d]	Physicist [d]	Student [d]
Subsystem:	60,000	x	x	x	x	x

Contingency

M&S Contingency Rules Applied

- M4
- Engineering Estimate based on Similar Items

Labor Contingency Rules Applied

- L4
- Engineering Estimate based on Similar Items

Comments:

Provide any additional details that may affect scope, effort, materials, estimating technique, sketches, calculations, etc.

Risk Analysis: (To Be Completed by Subsystem Manager)

- Schedule Risk – (see Impact Assessment Matrix and Risk Classification Matrix)
  - Potential problem:
  - Mitigation:
- Cost Risk – (see Impact Assessment Matrix and Risk Classification Matrix)
  - Potential problem:
  - Mitigation:
- Technical/Scope Risk – (see Impact Assessment Matrix and Risk Classification Matrix)
  - Potential problem:
  - Mitigation:

Subsystem Manager: _____ **Date:** _____

Basis of Estimate Documents

Procure SiPMs for EMCal

	sPHENIX Detector **Relativistic Heavy Ion Collider** **BASIS of ESTIMATE (BoE)**	**Date of Est:** 26-Oct-2015 **Prepared by:** E.J. Mannel DocNo. (refer Rev. Log): Rev. 1
WBS number: 1.6.2.2.11	**WBS Title:** Order production EMCal sensors	
WBS Dictionary Definition: Procure optical sensors for EMCal and provide over sight of procurement process		
Estimate Type (check all that apply): ___ Work Complete ___ Existing Purchase Order ___ Catalog Listing or Industrial Construction Database ___ Documented Vendor Quotation based on Drawings/ Sketches/ Specifications X Budgetary Estimate by Vendor/Fabricator based on Sketches, Drawings, or other Written Correspondenc ___ Engineering Estimate based on Similar Items or Procedures ___ Engineering Estimate based on Analysis ___ Expert Opinion		
Supporting Documents (including but not limited to): *For example, attach an engineering estimate or budgetary quote, along with supporting sketches or calculations.*		

Details of the Base Estimate (explanation of the Work)

This BOE is for the procurement of the 98,304 optical sensors required for the EMCal detector. The optical sensors are standard production items for the vendor of the component specified in the reference design. The optical sensors require a dynamic range of 10^4, a gain of 10^5 and capable of operating in a 1.5T magnetic field.

Assumptions Used in Developing Estimate:

Component cost estimate is based on the number of devices required for reference design plus 10%, and budgetary estimate from vendor. Labor estimate is based on time estimated to update order specifications and verify delivery of components. It is assumed that the optical sensor for both the EMCal and HCal will be identical.

Cost Summary

	Material [$]	Designer [d]	Engineer [d]	Tech [d]	Physicist [d]	Student [d]
Subsystem:	920,000	x	22	x	x	x

Contingency

M&S Contingency Rules Applied

- **M4: 40%**
- *Pricing based on budgetary quote from vendor. Devices are off the self components.*

Labor Contingency Rules Applied

- L2- 10%
- *Labor is for producing order specification documents, tracking order and verifying delivery of components*

Comments:

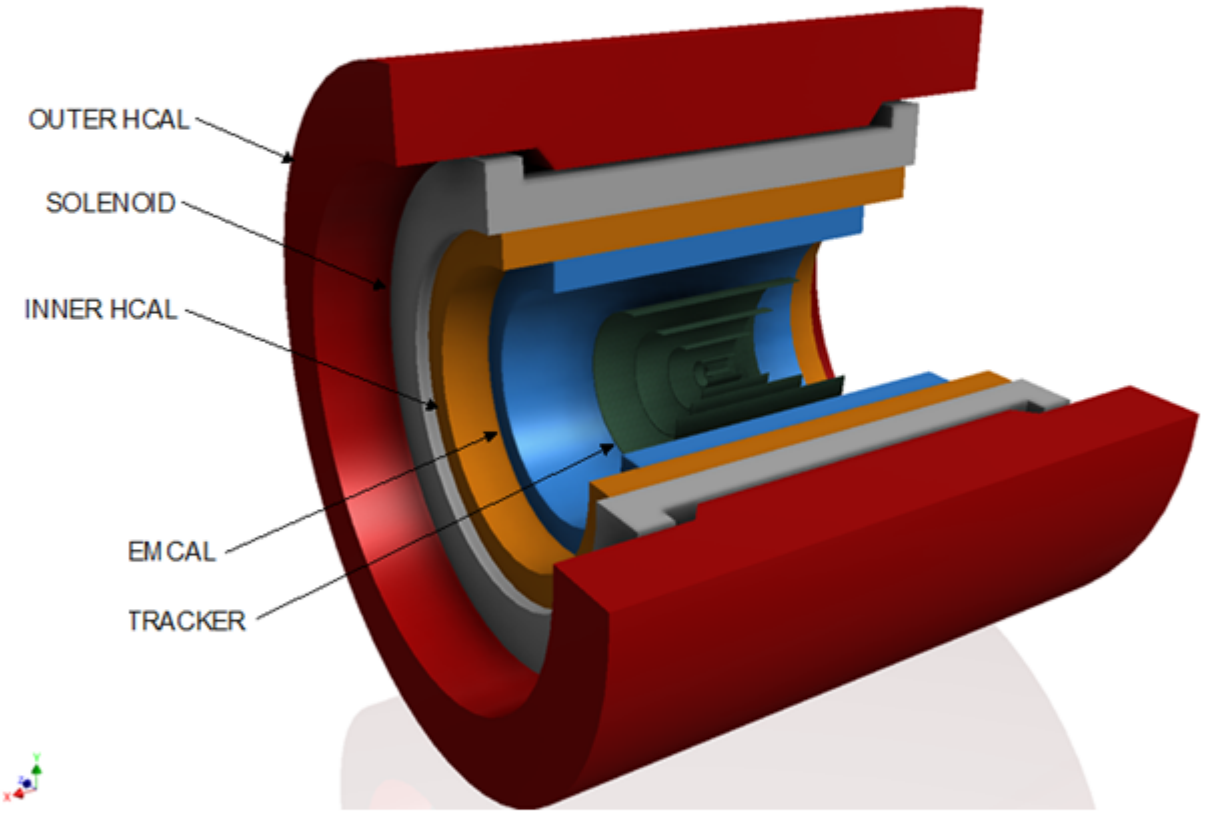
Provide any additional details that may affect scope, effort, materials, estimating technique, sketches, calculations, etc.

Risk Analysis: – (To Be Completed by Subsystem Manager)

- Schedule Risk – (see Impact Assessment Matrix and Risk Classification Matrix)
  - Potential problem:
  - Mitigation:
- Cost Risk – (see Impact Assessment Matrix and Risk Classification Matrix)
  - Potential problem:
  - Mitigation:
- Technical/Scope Risk – (see Impact Assessment Matrix and Risk Classification Matrix)
  - Potential problem:
  - Mitigation:

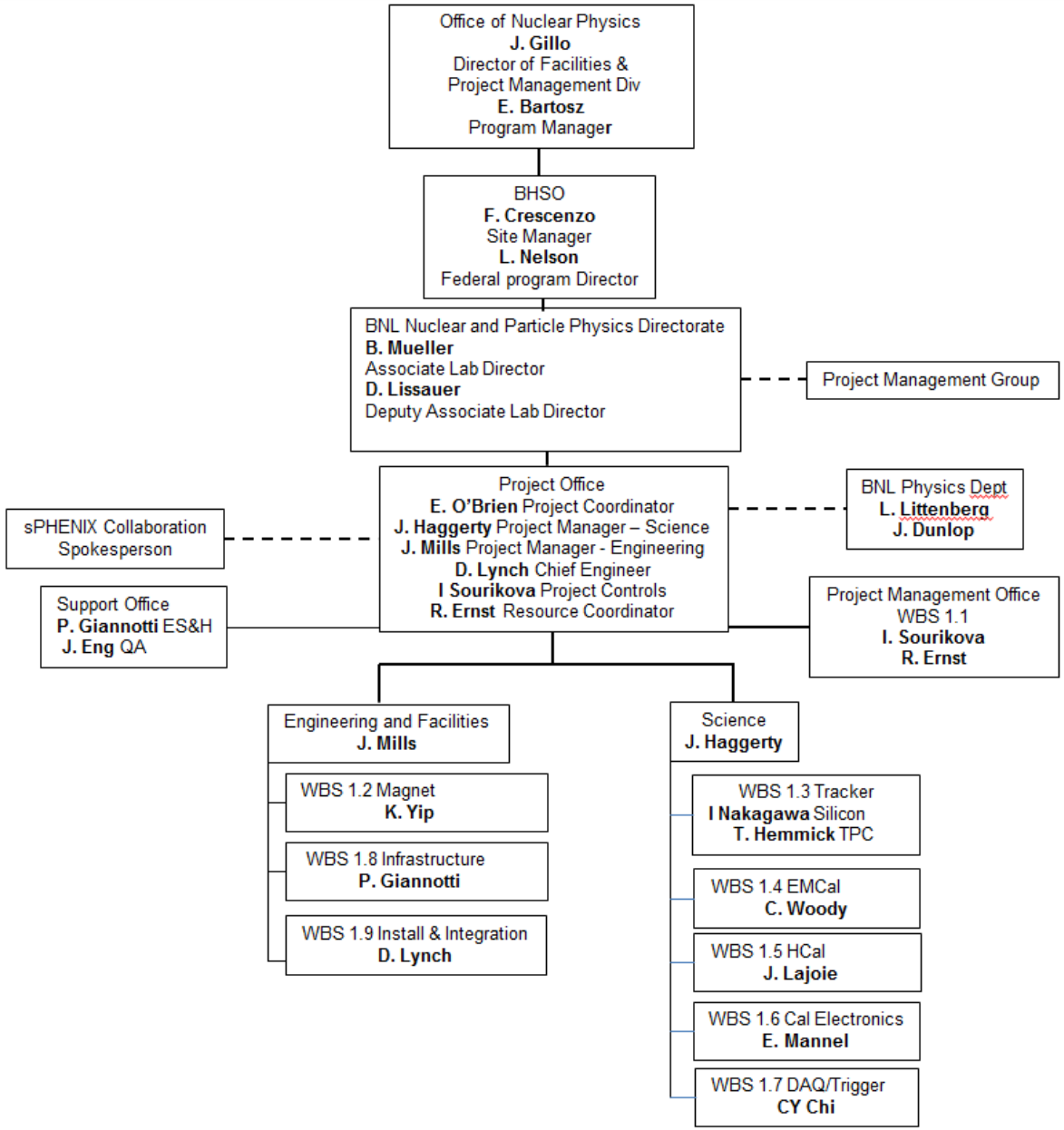
sPHENIX Project Scope

1.1 Project Management
1.2 SC-Magnet
1.3 Tracker
1.4 EMCal
1.5 HCal
1.6 Calorimeter Electronics
1.7 DAQ/Trigger
1.8 Infrastructure
1.9 Installation/Integration



*** Tracker to be funded from outside sources, Japanese funding agencies, NSF and other international sources.**

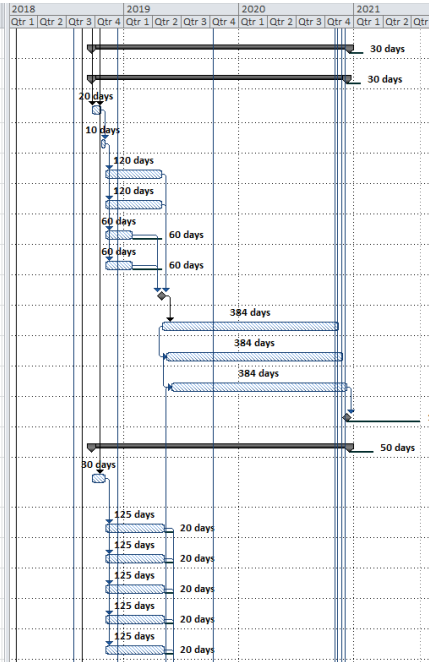
Project Organization



Status of Project Planning

- sPHENIX resource-loaded project plan has been created to account for DOE schedule guidance, latest subsystem updates, new labor resource sheets with FY16 rates, and explicit separation between on-project (Total Project Cost) and off-project tasks.
- Input from Project Management team, L2 & L3 managers, subsystem engineers
- >1600 tasks total. The project file is fully resource -loaded and linked (22 files total in MS-Project)
- Critical path goes through SiStrip Tracker, but the HCal is only 3 weeks behind.

WBS	Name	Duration	Start	Finish	Resource Names	Fixed Cost
1.4.4	**EMCal Production**	**559 days**	**Wed 6/20/18**	**Wed 9/16/20**		**$0**
1.4.4.1	**EMCal Tower/Module Production**	**554 days**	**Wed 6/20/18**	**Wed 9/9/20**		**$0**
1.4.4.1.1	Update Design for Fabrication and Assembly	20 days	Wed 6/20/18	Thu 7/19/18	SCI3 PO[10%],PROF4 PO M[20%],TECH3 PO D[20%]	$0
1.4.4.1.2	Production Readiness and Safety Review	10 days	Fri 7/20/18	Thu 8/2/18	STUDENT[10%],SCI3 PO[50%],PROF3 PO M[50%],TEC	$0
1.4.4.1.3	Procurement of calorimeter materials	120 days	Fri 8/3/18	Tue 1/29/19	SCI3 PO[20%],PROF4 PO M[20%]	$0
1.4.4.1.4	Establish Fabrication contract	120 days	Fri 8/3/18	Tue 1/29/19	PROF3 PO M[10%]	$0
1.4.4.1.5	Fabricate tooling for mass production	60 days	Fri 8/3/18	Fri 10/26/18	TECH3 PO M[200%]	$50,000
1.4.4.1.6	Set up factory for mass production	60 days	Fri 8/3/18	Fri 10/26/18	TECH3 PO M[200%]	$20,000
1.4.4.1.7	Start Module Fabrication	0 days	Tue 1/29/19	Tue 1/29/19		$0
1.4.4.1.8	Fabricate modules	384 days	Wed 1/30/19	Tue 8/11/20	STUDENT[600%],SCI3 PO[50%],TECH3 PO M[700%],T	$3,680,000
1.4.4.1.9	Test modules in factory	384 days	Wed 2/13/19	Tue 8/25/20	STUDENT[200%],SCI3 PO[50%],TECH3 PO M	$10,000
1.4.4.1.10	Test modules as delivered	384 days	Thu 2/28/19	Wed 9/9/20	STUDENT[200%],SCI3 PO[50%],TECH3 PO M[50%]	$10,000
1.4.4.1.11	EMCal Module Production Complete	0 days	Wed 9/9/20	Wed 9/9/20		$0
1.4.4.2	**EMCal Module/Sector Assembly**	**559 days**	**Wed 6/20/18**	**Wed 9/16/20**		**$0**
1.4.4.2.1	Update any design changes based on FS prototype, Factory Input and Final Design Review	30 days	Wed 6/20/18	Thu 8/2/18	SCI3 PO[20%],PROF4 PO M[50%],TECH3 PO D[50%]	$0
1.4.4.2.2	Fabricate mechanical parts	125 days	Fri 8/3/18	Tue 2/5/19	TECH3 PO M[300%],TECH3 PO E	$250,000
1.4.4.2.3	Fabricate parts for light collection system	125 days	Fri 8/3/18	Tue 2/5/19	TECH3 PO M[200%]	$75,000
1.4.4.2.4	Fabricate parts for readout system	125 days	Fri 8/3/18	Tue 2/5/19	TECH3 PO M[200%]	$50,000
1.4.4.2.5	Fabricate parts for calibration system	125 days	Fri 8/3/18	Tue 2/5/19	TECH3 PO M[200%]	$50,000
1.4.4.2.6	Fabricate parts for auxillary systems	125 days	Fri 8/3/18	Tue 2/5/19	TECH3 PO M	$50,000



WBS Structure

1 sPHENIX Design, Production, Commissioning

1.1 Project Management

1.2 Magnet

1.3 Tracker

1.4 EMCal

1.5 HCal

1.6 Calorimeter Electronics

1.7 DAQ/Trigger

1.8 Infrastructure

1.9 Installation/Integration

2 sPHENIX Preconceptual Activities

2.1 Decommissioning

2.2 Magnet Acceptance Testing

2.3 Tracker Generic R&D and Preconceptual Design

2.4 EMCal Generic R&D and Preconceptual Design

2.5 HCal Generic R&D and Preconceptual Design

2.6 Calorimeter Electronics R&D and Preconceptual Design

2.7 DAQ/Trigger generic R&D and Preconceptual Design

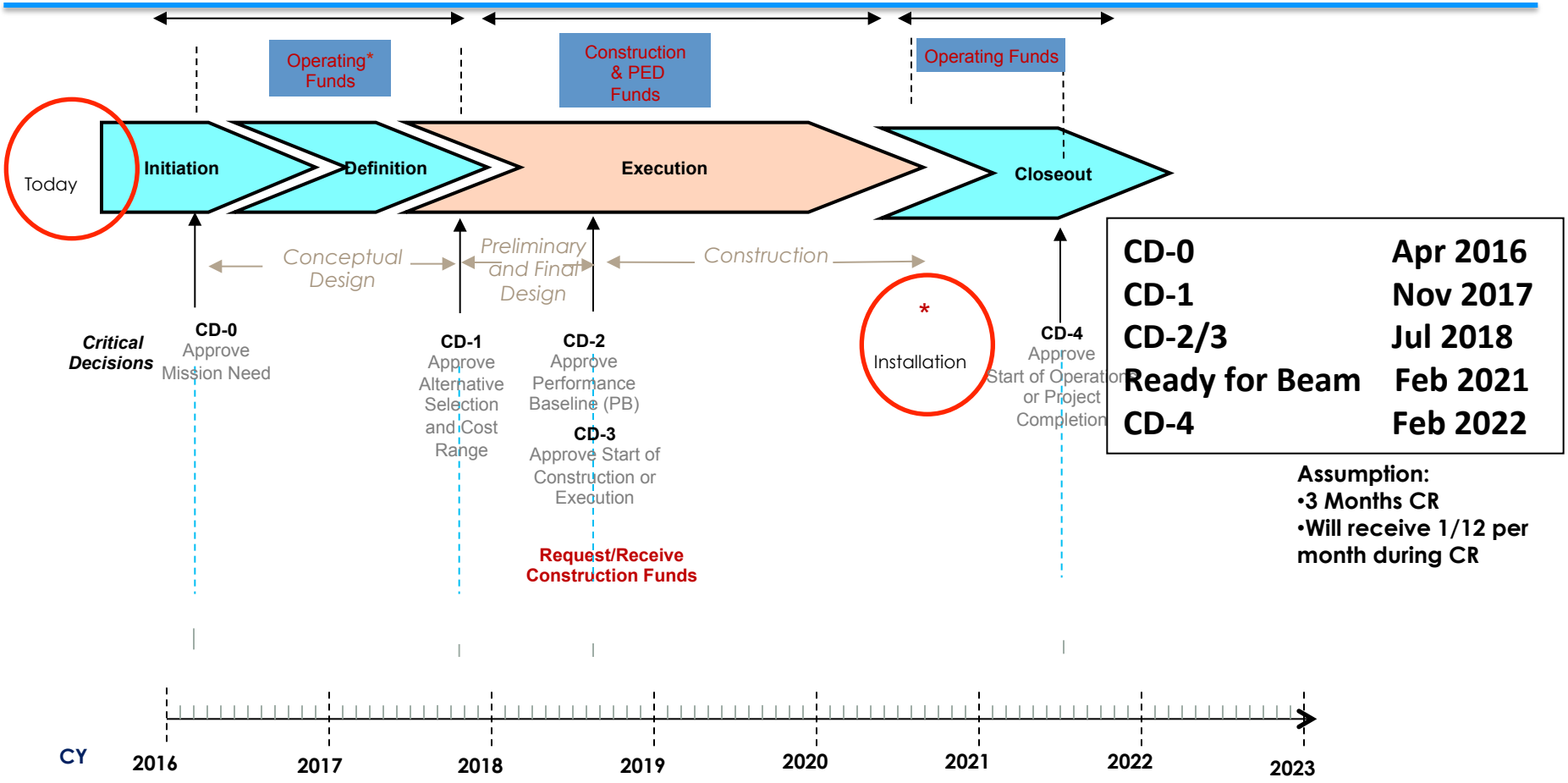
2.8 Infrastructure Preconceptual

2.9 Installation and Integration Preconceptual

The WBS structure has a few advantages:

- Natural separation of on-project and off-project costs and resources
- Allows one to balance resources and link tasks between on-project and off-project WBS elements
- No major changes to WBS structure once we get CD-1

Critical Decision Scenario



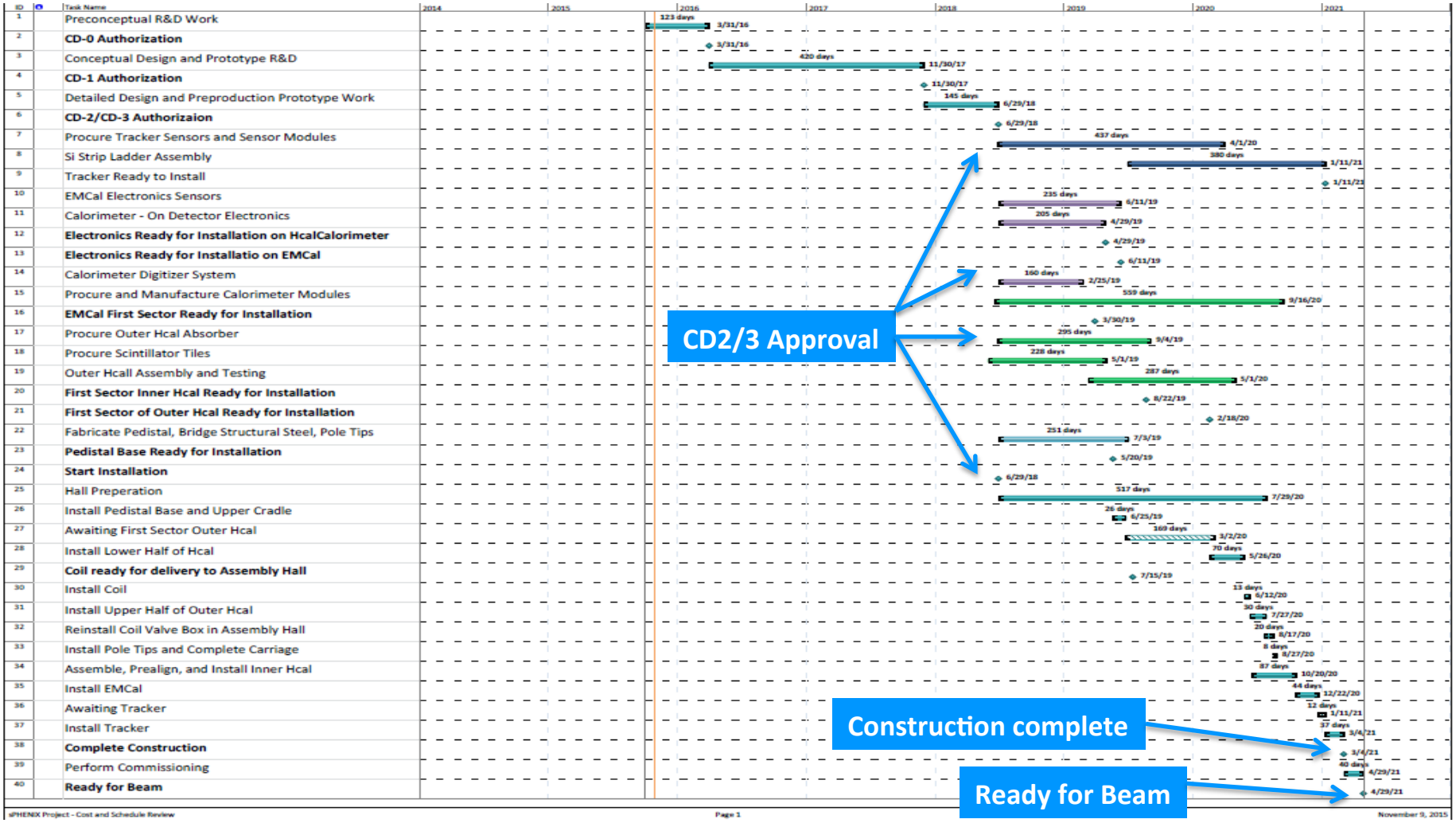
CD-0	Apr 2016
CD-1	Nov 2017
CD-2/3	Jul 2018
Ready for Beam	Feb 2021
CD-4	Feb 2022

Assumption:
- 3 Months CR
- Will receive 1/12 per month during CR

- Operating Funds are used for conceptual design between CD-0 and CD-1. Operating funds may also be used prior to CD-4 for R&D, NEPA, D&D, ES&H, transition, startup, and training costs. Non-federal funds from other sources that are considered capital funds and are included in the "Total line item cost" as OPC.
- Good Practice—For the first year that TEC is requested, ensure that OPC is also requested for that year. The OPC will allow the project to continue in a long CR until TEC is available and new starts are allowed.
- MIE funds are more flexible than Line Items. Moving OPC to TEC or vice versa is much easier than for Line-Item reprogramming since MIE funds are "batched."
- New Start is defined as the first use/appropriation of any TEC funds (including TEC PED) for both line items and MIEs project.

sPHENIX Schedule

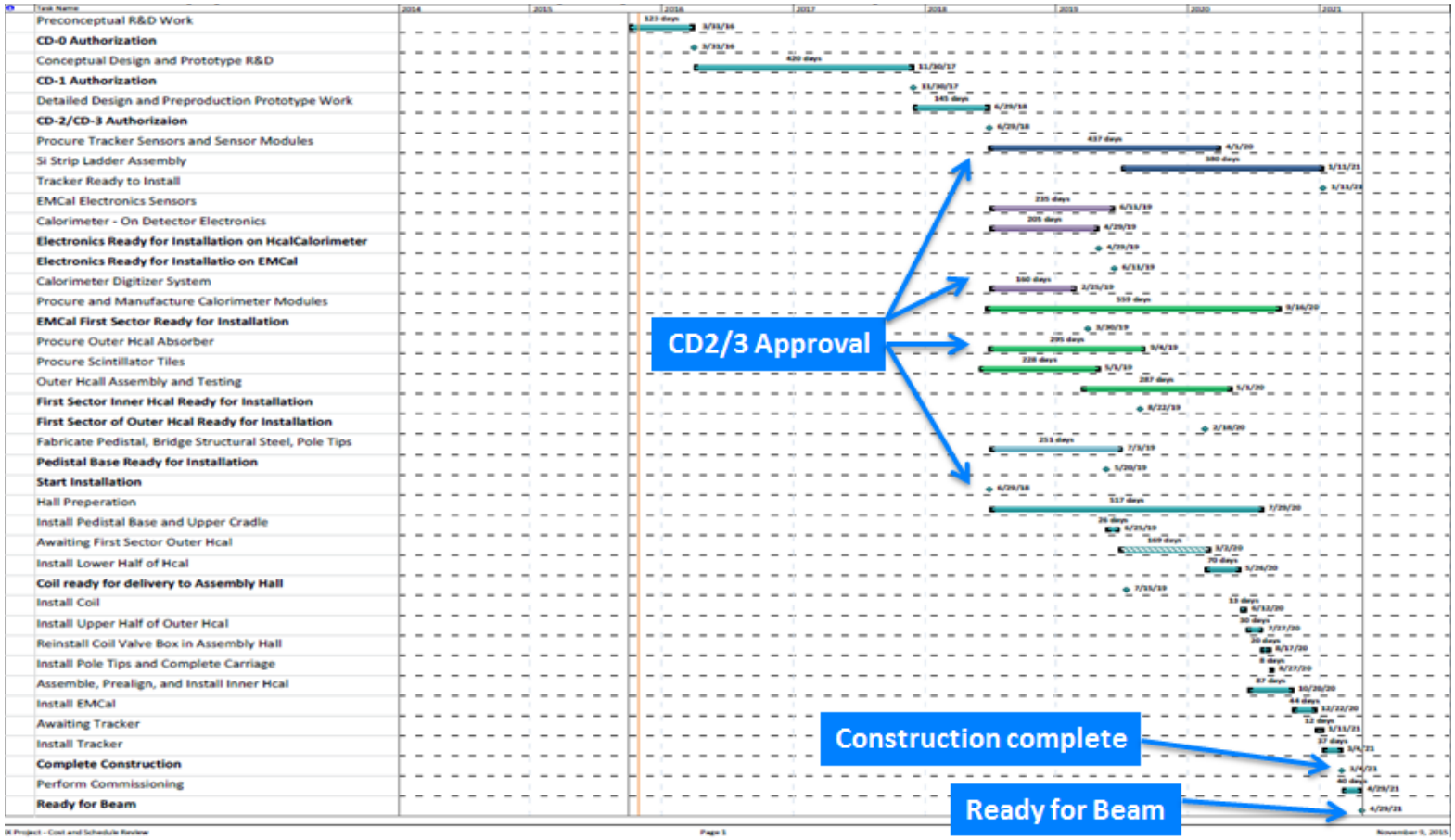
Initial schedule shows Installation complete **Mar 1 2021**. Commissioning complete **Apr 29, 2021**.
Based on authorization for CD-1 Nov 2017, CD-2/3 Jul 2018.
Two approaches to address the tight schedule:
1) CD-3a in Nov 2017 for long lead time items. 2) One year stretch in the schedule



sPHENIX Schedule

- **A CD-3a for HCal steel procurement at time of CD-1 and permission to begin SiStrip production in Japan at CD-1 brings the Ready for Beam date back to Jan 2021.**
  - **SiStrip production start is on critical path with HCal steel purchase lagging by 3 wks**

- **For a 1 year schedule stretch, and no CD-3a, has the detector Ready for Beam date is May 1, 2021 with a 7 month float to RHIC beam in Jan 2022.**



Material Cost by FY & WBS Category

All in FY16$

Sum of Fixed Cost		Column Labels						
Row Labels	Descriptions	2016	2017	2018	2019	2020	2021	Grand Total
1.1	Project Mgt	10,000	20,000	20,000	20,000	20,000	5,000	95,000
1.2.	Magnet			1,877,764	28,000			1,905,764
1.4.	EMCal	35,000	263,000	565,000	3,700,000			4,563,000
1.5.	HCAL			5,999,000	160,000			6,159,000
1.6.	Cal Elec	105,000	107,000	4,162,200	30,000			4,404,200
1.7.	DAQ & Trigger	16,000	71,000	1,116,000	525,000			1,728,000
1.8.	Infrastructure			1,075,000	593,000			1,668,000
1.9.	Installation			263,000	7,500	29,000	12,000	311,500
Grand Total		**166,000**	**461,000**	**15,077,964**	**5,063,500**	**49,000**	**17,000**	**20,834,464**

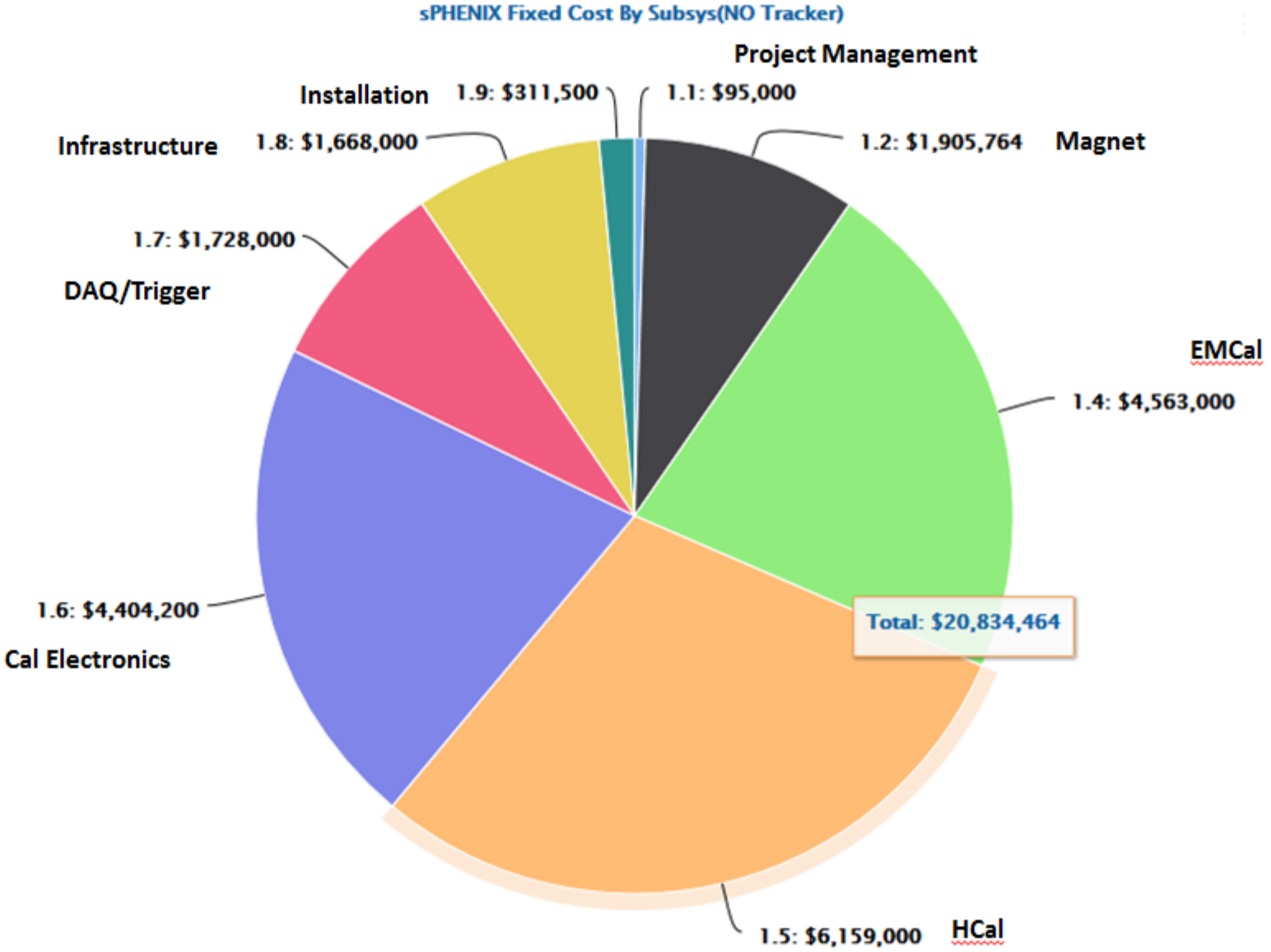
$20.8M, ~6% above Nov 2014 estimate

Budget savings are being investigated including :

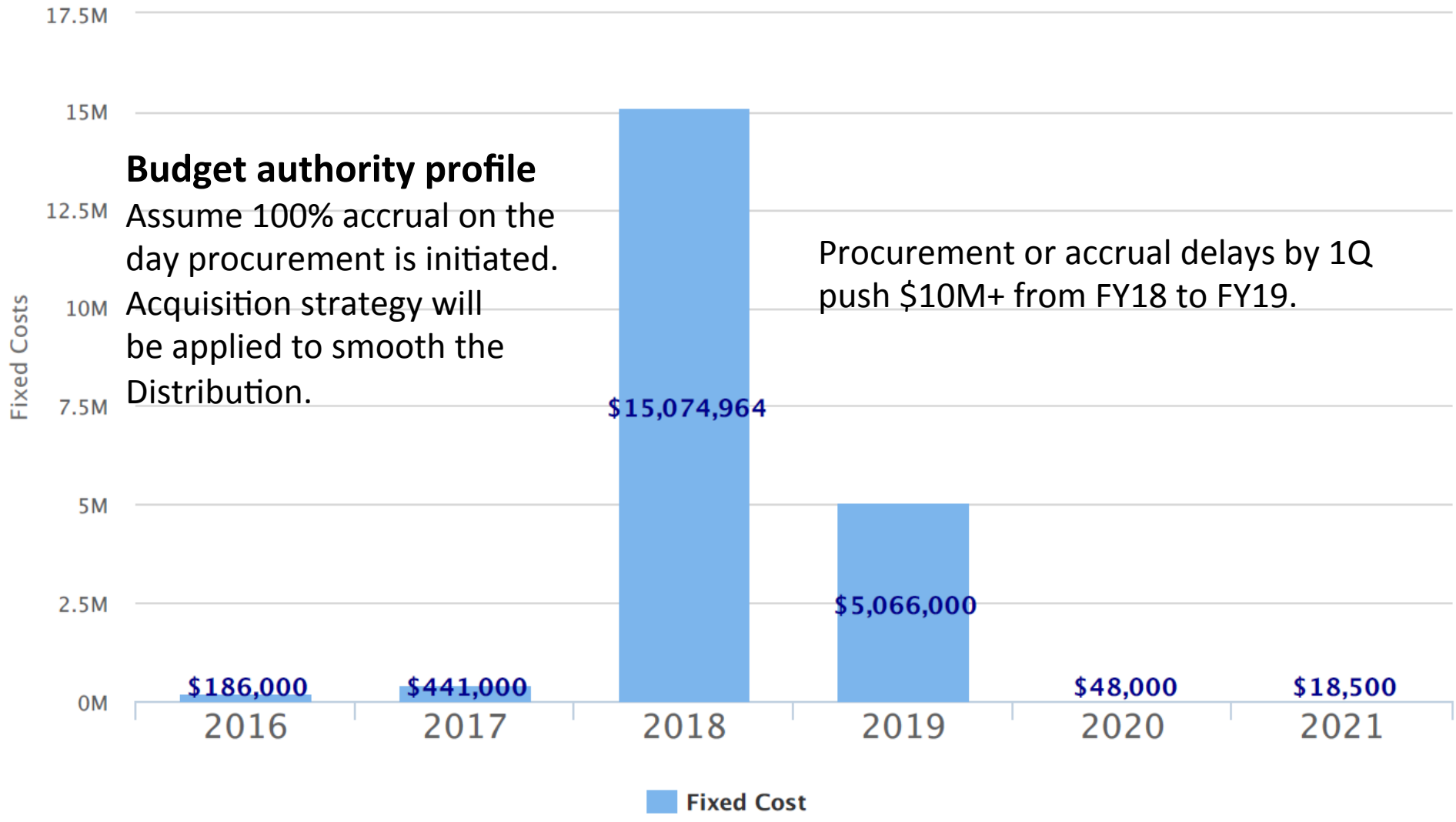
- Min Bias Trigger Det in WBS 1.7 contributed by international institution ($0.5M)
- R&D being performed now may mitigate the need to charge this work to the TPC
- NSF contributions (**for instance EMCal electronics, $4M**)
- Retirement of risk and assoc. contingency reduction as R&D advances
- General scrubbing

Potential reductions in the $4.5-5M range FY16$ direct costs

Material Costs by Subsystem w/o Tracker



Material Costs by FY -Direct

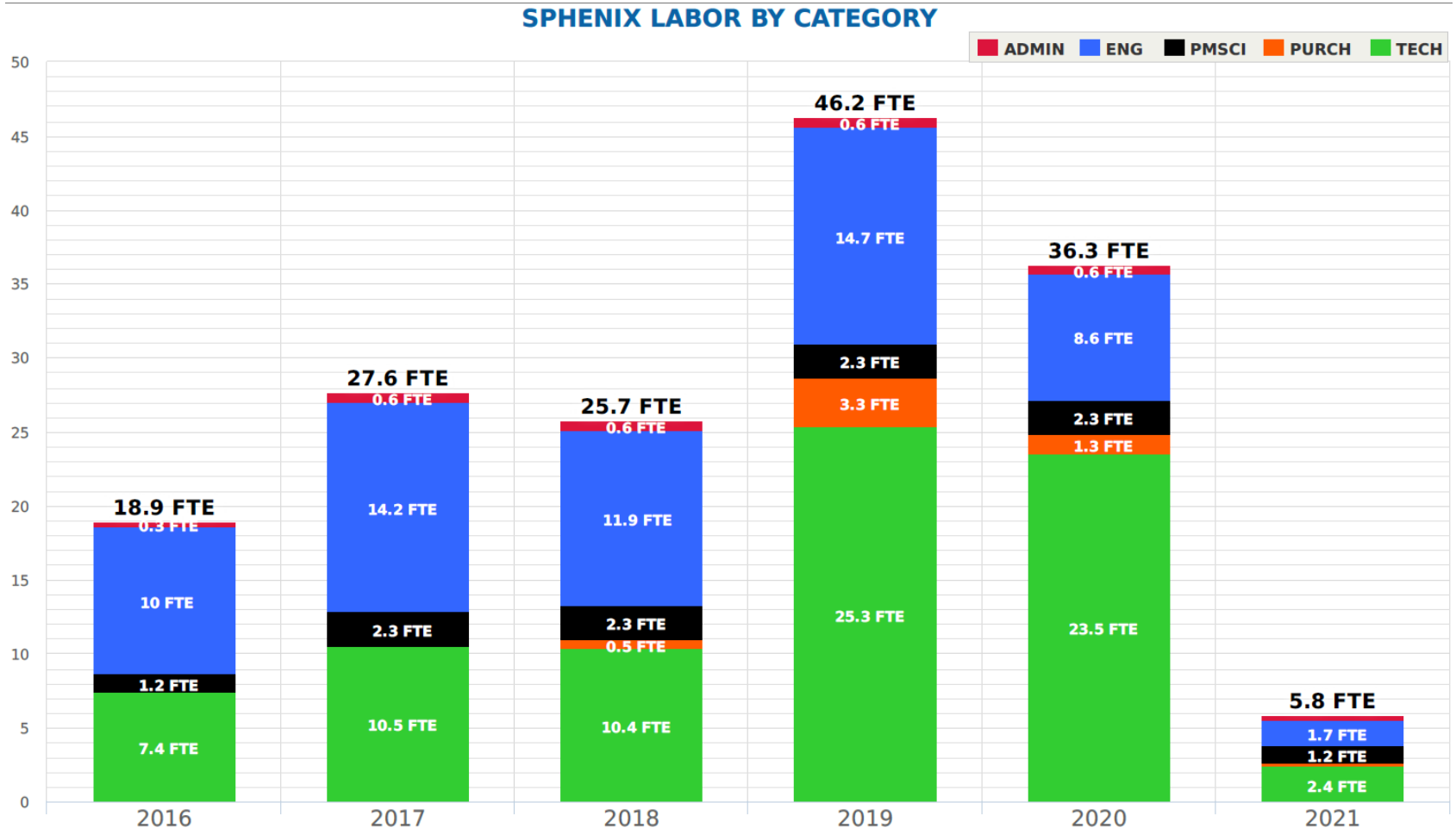


Budget authority profile
Assume 100% accrual on the day procurement is initiated. Acquisition strategy will be applied to smooth the Distribution.

Procurement or accrual delays by 1Q push $10M+ from FY18 to FY19.

Labor Profile for DOE Project

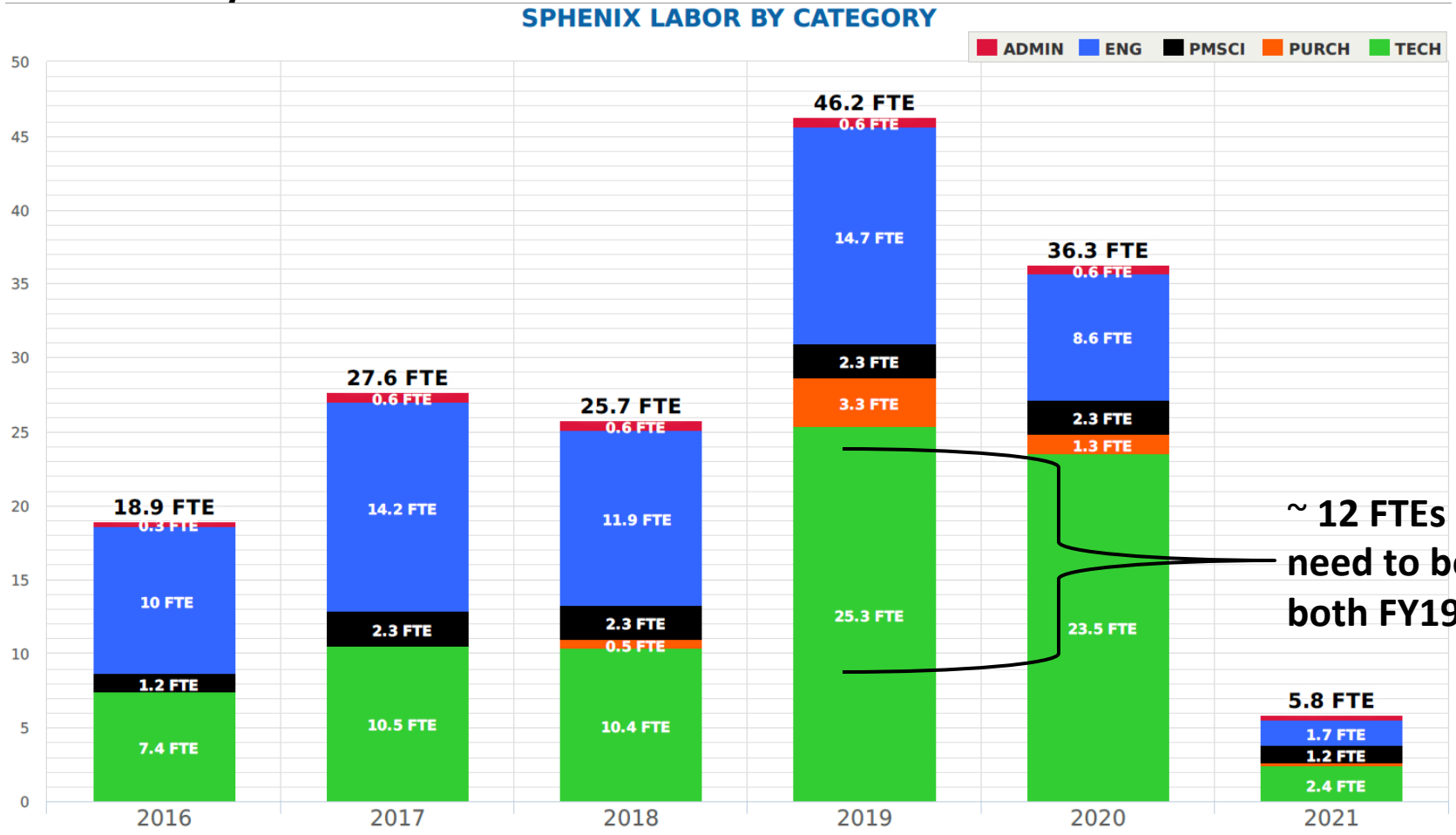
University contributions of scientists and students not shown



Almost all engineers and on-project scientists have been identified along with ~10 FTEs of techs. A challenge is the technician "bump" in FY19-20.

Labor Profile for DOE Project

University contributions of scientists and students not shown



~ 12 FTEs of techs need to be found in both FY19, FY20

Two approaches to address technician bump in FY19/FY20:

- **1 year schedule stretch smooths the bump and makes it manageable (+$400k)**
- **Cover work by a combination of univ labor, job shoppers, vis sci, students (- $2000k)**

The second approach creates a "re-direct" challenge

Labor Cost by FY & WBS Category

All in FY16$ **Costed at BNL labor rates**

Row Labels	WBS Description	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21	Grand Total
1.1	Project Management	$545,173	$1,059,252	$1,053,624	$1,068,883	$1,073,176	$511,967	$5,312,075
1.2	Magnet	$760,847	$663,760	$838,987	$1,155,310	$548,814	$6,847	$3,974,566
1.4	EMCaL	$252,504	$669,520	$707,488	$1,901,348	$1,811,637	$19,859	$5,362,356
1.5	HCAL	$740,666	$976,017	$746,224	$1,373,509	$1,547,746		$5,384,163
1.6	Cal Elec	$249,224	$435,659	$284,193	$494,177	$40,656		$1,503,909
1.7	DAQ & Trigger	$101,124	$177,306	$197,661	$342,092	$36,528		$854,710
1.8	Infrastructure	$399,598	$547,268	$200,354	$715,743	$64,325		$1,927,289
1.9	Installation	$119,246	$103,883	$262,111	$449,811	$599,895	$437,945	$1,972,890
Grand Total		$3,168,383	$4,632,666	$4,290,642	$7,500,873	$5,722,778	$976,618	**$26,291,958**

Budget changes are being investigated including

Reductions:

- Substituting fraction of BNL Techs in FY19, FY20 for Visiting scientists, contract labor and students, or stretching the schedule allowing the techs to spread into FY21.
- R&D being performed now under LDRDs and Program Development Funds may mitigate the need to charge some work in FY16-FY18 to the TPC
- Retirement of risk and assoc. contingency reduction as R&D advances
- General scrubbing

Increases:

- A 1 year schedule stretch out adds ~$400k in escalated labor costs

Budget Scenarios

Standard Scenario in the Project files:

- CD-1 start Nov 2017, CD2-3 start Jul 2018
- Need CD-3a of long lead time items to complete by Jan 2021
- Little float on the critical path
- Labor bump in Techs in FY19, FY20

Standard scenario with one year stretch

- Same CD1 and CD-2/3 starts
- W/O CD-3a, sPHENIX ready for beam May 2021 w/ 7 month float to Jan 2022 RHIC run
- Smooths tech bump
- Modest escalation costs

Standard Scenario with budget reductions

- Same CD1 and CD-2/3 start
- Need CD-3a of long lead time items
- Take credit for successful planned NSF MRI(EMCal electronics for instance)
- Fix FY19,FY20 tech bump (12 FTEs* 2 years) w/ Univ labor, Vis Sci, job shoppers & stdnts.
- Reduces savings from project labor burden. **Impacts potential redirects**

Budget Scenarios - continued

Standard Scenario		Standard Scenario w/ 1 yr stretch		Standard Scenario w/ Budget Reductions	
TEC Estimate	**AY $M**	**TEC Estimate**	**AY $M**	**TEC Estimate**	**AY $M**
Labor	27.3	Labor	27.6	Labor	24.0
Material	23	Material	23.1	Material	19.0
Contingency (25%)	12.4	Contingency (25%)	12.4	Contingency (30%)	12.6
Subtotal TEC	**62.7**	**Subtotal TEC**	**63.1**	**Subtotal TEC**	**55.6**
OPC Estimate		**OPC Estimate**		**OPC Estimate**	
Labor	10.7	Labor	10.7	Labor	10.7
Material	0.7	Material	0.7	Material	0.7
Contingency (5%)	0.6	Contingency (5%)	0.6	Contingency (5%)	0.6
Subtotal OPC	**12.0**	**Subtotal OPC**	**12.0**	Subtotal OPC	**12.0**
Total Project Costs (TPC)	**74.7**	**Total Project Costs (TPC)**	**75.1**	**Total Project Costs (TPC)**	**67.6**

Budget Scenario Profiles

	2016	2017	2018	2019	2020	2021	2022	Grand Total
Standard Scenario								
Total AYk$ with Burden & Contingency Estimate	4,667	7,299	29,552	20,839	10,459	1,854		74,669
Standard Scenario w/ 1 yr stretch								
Total AY $ withBurden & Contingency Estimate	4,667	7,299	29,552	15,951	7,789	7,965	1,878	75,100
Standard Scenario w/ Budget Reductions								
Total AY $ with Burden & Contingency Estimate	4,667	7,299	25,093	19,709	8,860	1,931		67,559

Standard Scenario

- Based on Project file. Ready for beam early 2021

Standard Scenario w/ 1 year stretch

- Based on Project file with additional 1 year stretch. Ready for beam in early 2022
- Total labor remains the same

Standard Scenario w/ Budget Reductions

- Based on Project file. Ready for beam early 2021
- ~12 FTE techs in FY19, FY20 assigned to job shoppers, Univ labor, Vis Sci, students
- Take credit for 1 successful NSF MRI

Issues and Concerns

- There are a number of open technical questions (typical for pre CD-0):
  - Tracker technology choice
  - EMCal 1-D or 2-D projective
  - Stand alone cryo for magnet or integration with RHIC cryo.
- The Project Construction time is short between anticipated CD2/3 date and start of RHIC run in 2021. Even if we stretch the schedule one year to Jan 2022, an efficient procurement start will be important.
- Tracker is planned to be funded from non-DOE sources (Si from JSPS, TPC from NSF and others). Discussions have started but nothing is set.
- The technically driven funding profile is steep. Need to find ways to smooth.
- Labor needs have been estimated, but not all resources are identified. A one year schedule stretch helps the need for techs in FY19-20 by stretching over three years instead. However this has an impact on re-directs.
- Transition for MS-Project to Primavera by beginning of FY18. Need to develop expertise.

Summary

- A Project Team has been established to carry out the sPHENIX project
- Preconceptual design and generic R&D is ongoing
- A resource-loaded project plan exists (in MS-Project) that is being used to plan the schedule, budget and resources for the project
- Preliminary Project documentation exists
- The initial cost range including full burdens, escalation and contingency is 55-65M AY$ TEC and 65-75M AY$ TPC.
- The Tracker is off-project.
- A resource profile exists by job category. The on-project labor is charged at BNL rates.
- A preliminary schedule exists that enables sPHENIX to be ready for beam early CY 2021 but requires CD-3a, has a potential issue with technician availability and has little float. It is also a challenge for funding redirection.
- A 1 year stretch schedule also exists that solves the labor bump and gives the project ~7 month float.

Back Up

Assigned Labor Rates

Labor rates assigned with FY16 BNL Labor bands and sorted by Department

Exerpt from Microsoft Project Resource Table

Resource Name	Type	Group	Std. Rate	Accrue At	Base Calendar	Code
ADMIN1 PO	Work	Administrative	$63.15/hr	Prorated	sPHENIX_Holidays_Only	Physics
PROF3 PO E	Work	Engineering	$89.84/hr	Prorated	sPHENIX_Holidays_Only	Physics
PROF3 PO M	Work	Engineering	$89.84/hr	Prorated	sPHENIX_Holidays_Only	Physics
PROF4 PO E	Work	Engineering	$104.30/hr	Prorated	sPHENIX_Holidays_Only	Physics
PROF4 PO M	Work	Engineering	$104.30/hr	Prorated	sPHENIX_Holidays_Only	Physics
SCI3 PO	Work	Scientific	$121.50/hr	Prorated	sPHENIX_Holidays_Only	Physics
TECH3 PO E	Work	Technical	$81.10/hr	Prorated	sPHENIX_Holidays_Only	Physics
TECH3 PO M	Work	Technical	$81.10/hr	Prorated	sPHENIX_Holidays_Only	Physics
TECH3 PO D	Work	Technical	$81.10/hr	Prorated	sPHENIX_Holidays_Only	Physics
ADMIN1 AD	Work	Administrative	$63.15/hr	Prorated	sPHENIX_Holidays_Only	CA-D
PROF3 AD	Work	Engineering	$89.84/hr	Prorated	sPHENIX_Holidays_Only	CA-D
PROF4 AD	Work	Engineering	$104.30/hr	Prorated	sPHENIX_Holidays_Only	CA-D
SCI3 AD	Work	Scientific	$121.50/hr	Prorated	sPHENIX_Holidays_Only	CA-D
TECH3 AD	Work	Technical	$81.10/hr	Prorated	sPHENIX_Holidays_Only	CA-D

Standard Labor Rates for FY16 as of Sep 1, 2015

Band	Fringe Rate	2080 hrs / 2088 Hrs FY 16 Prod Hrs	FY 16 Rate with Fringe	(Union Esc) FY 16 Annual Cost Salary and Fringe
ADMIN1	39.0%	1,763.12	42.25	$ 74,491.82
ADMIN2	39.0%	1,717.97	53.30	91,567.68
ADMIN3	39.0%	1,729.61	63.15	109,224.75
ADMIN4	39.0%	1,729.81	76.20	131,811.79
ADMIN5	39.0%	1,768.78	92.70	163,966.04
ADMIN6	39.0%	1,768.27	122.70	216,967.22
ADMIN7	39.0%	1,780.12	159.20	283,395.30
PROF1	39.0%	1,816.72	50.00	90,836.20
PROF2	39.0%	1,778.95	72.10	128,262.02
PROF3	39.0%	1,774.55	89.85	159,443.72
PROF4	39.0%	1,772.83	104.30	184,906.00
PROF5	39.0%	1,756.46	121.70	213,761.68
PROF6	39.0%	1,785.10	144.00	257,053.92
SCI1	39.0%	1,876.30	86.70	162,675.56
SCI2	39.0%	1,802.63	106.30	191,620.06
SCI3	39.0%	1,795.36	121.50	218,136.81
SCI4	39.0%	1,799.65	144.35	259,779.51
SCI5	39.0%	1,778.10	179.05	318,369.17
SEASONAL	39.0%	2,058.66	22.80	46,937.36
TECH1	39.0%	1,815.05	54.20	98,375.48
TECH2	39.0%	1,735.54	70.35	122,095.36
TECH3	39.0%	1,734.37	81.10	140,657.06
TECH4	39.0%	1,746.64	92.55	161,651.09

Used Standard band rates (nearest) the average rate of the Physics Staff population currently charging Experimental Operations.
Use a standard productive hours of 1760
The project files also inlude the standard BNL Holiday schedule.

Labor Profile for All incl Scientist and Students

All labor contributions including Univ scientists and students. Includes SiTracker Option